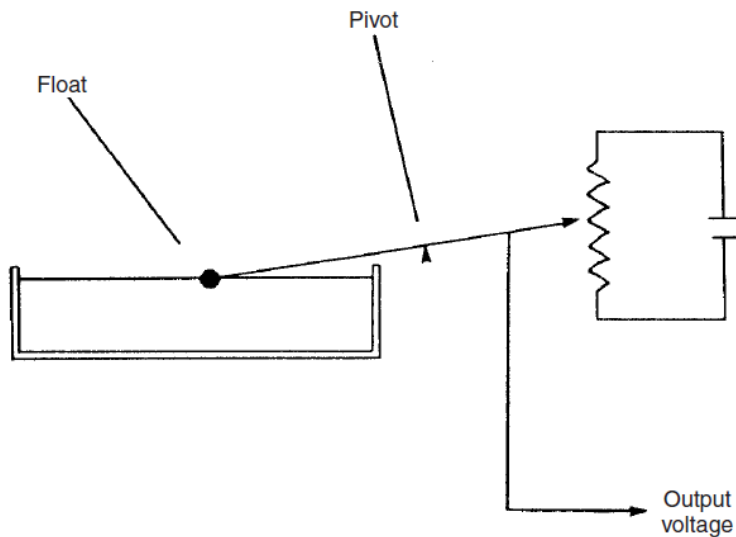


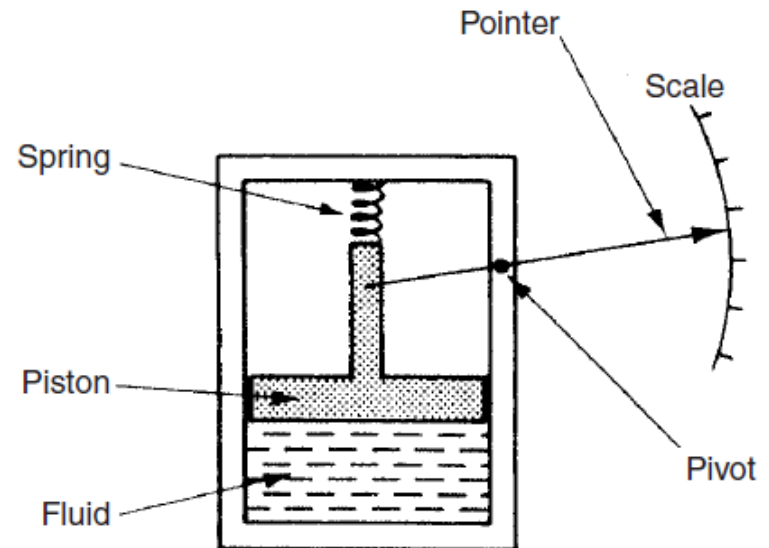
Classification of Instruments

1. Active and passive instruments

*Active Petrol Tank Level Indicator

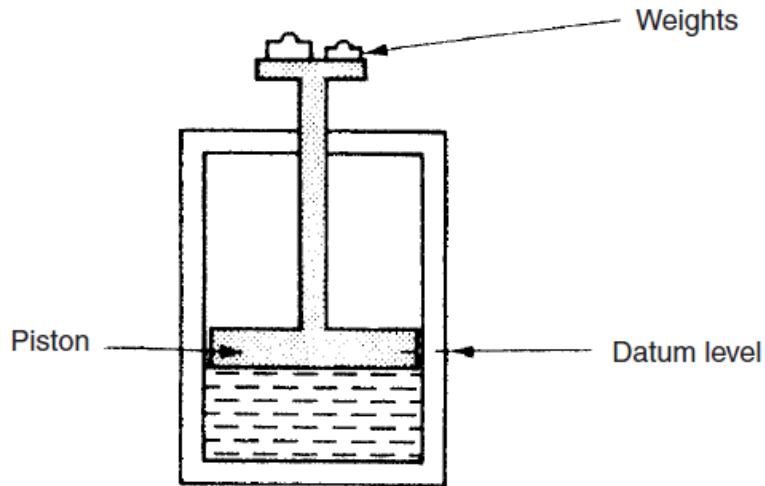


*Passive Pressure Gauge

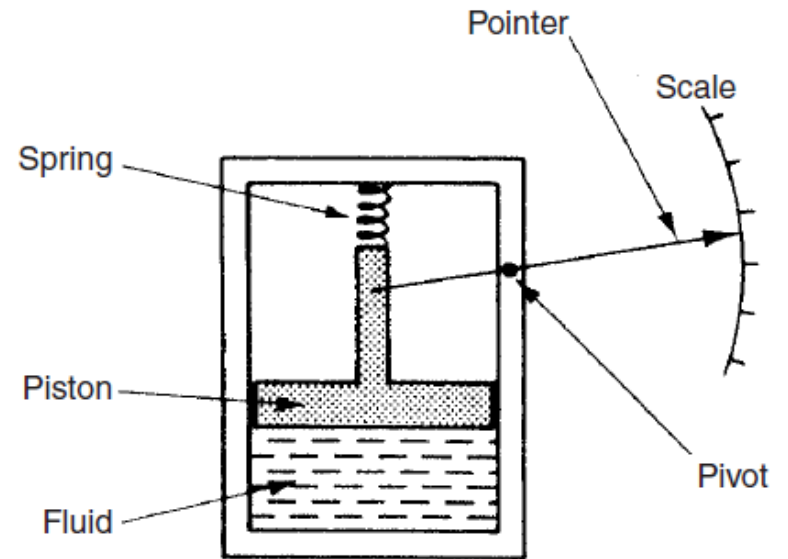


2. Null-type and deflection-type instruments

Null Type Dead Weight Pressure Gauge

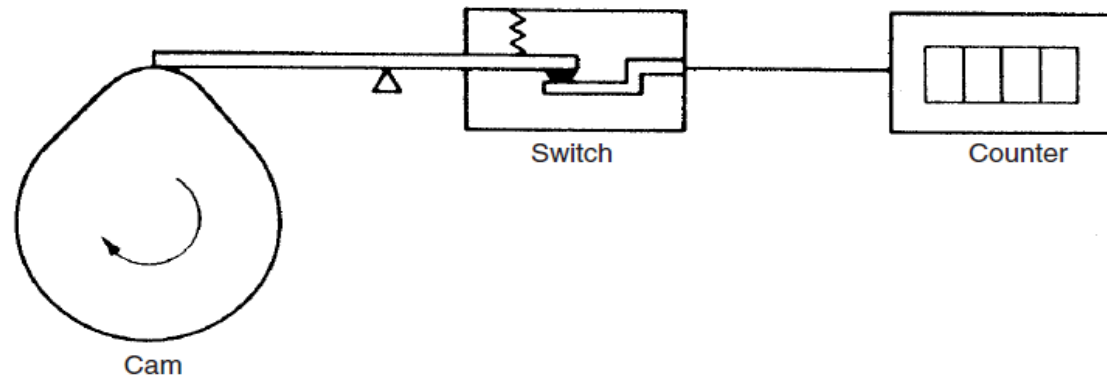


Deflection Type Pressure gauge



3. Analogue and Digital Instruments

- An analogue instrument gives an output that varies continuously as the quantity being measured changes. The output can have an infinite number of values within the range that the instrument is designed to measure. Example-Deflection type pressure gauge.
- A digital instrument has an output that varies in discrete steps and so can only have a finite number of values. Example- Rev counter



4. Indicating instruments and Instruments with a signal output

Indicating instruments can be divided in between those that merely give an audio or visual indication of the magnitude of the physical quantity measured and those that give an output in the form of a measurement signal whose magnitude is proportional to the measured quantity.

Instruments that have a signal-type output are commonly used as part of automatic control systems.

5. Smart and Non-smart instruments

6. Manually operated & Automatic type

instruments 7. Contacting and Non-contacting type instruments

- The accuracy expected from the instrument.
- When are the final data required (i.e. at the time of taking the measurement, or later on)
- The cost criteria
- Form of data to be displayed (indicating, recording, integrating etc)
- Whether quantity to be measured has constant value or it is a time variant?

Functions of Instruments

- **Indicating Function**
 - eg. Deflection of a pointer of a speedometer, Pressure gauge.
- **Recording Function**
 - eg. Potentiometric type of recorder used for monitoring temperature records instantaneous value of temperature on a strip chart recorder.
- **Controlling Function**
 - eg. Floats for liquid level control, Thermostats for temperature control.

Applications of Measurement Systems

1. Monitoring of processes and operations Eg.
Water & Electric energy meters installed in homes.

2. Control of processes and operations
Eg. Refrigerator with temperature measuring device.

3. Experimental engineering analysis

- Used to determine system parameters, variable and performance indices
- To test the validity of theoretical predictions

Standards of Measurement

A standard of measurement is defined as the physical representation of the unit of measurement.

Types of standards of measurement

1. International standards
2. Primary standards
3. Secondary standards
4. Working standards

Calibration

Calibration is the act or result of quantitative comparison between a known standard and the output of the measuring system measuring the same quantity.

Types of Calibration

1. Primary calibration
2. Secondary calibration
3. Direct calibration with known input source
4. Indirect calibration
5. Routine calibration